Development of FaSTAR-Move

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Abstract

FaSTAR-Move, an extended version of the fast unstructured-grid flow solver FaSTAR, is developed to analyse flow field around moving/deforming objects such as external store separation, flutter, rotor, and compressor/turbine of aero-engines.

Reasons and benefits of using JAXA Supercomputer System

JSS is necessary to complete numerical simulations of unsteady phenomena and to understand it in short time span.

Achievements of the Year

FaSTAR-Move have been extended to enable rotor-stator steady analysis for rotating cascade utilizing a mixing plane boundary condition and trim analysis for rotorcraft. It was comfirmed that FaSTAR-Move can reasonably simulate the flow field around them.

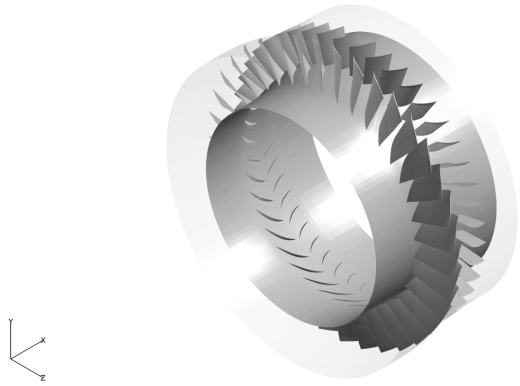

Fig. 1: Geometry of Stage 37

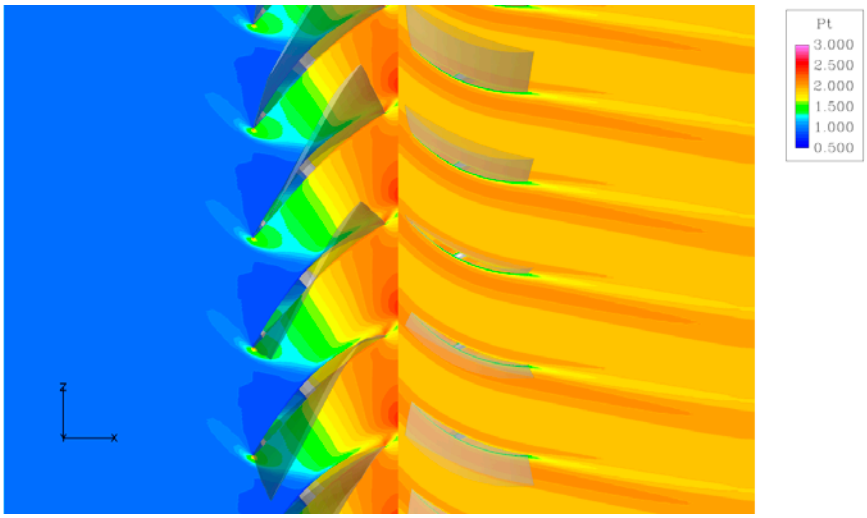

Fig. 2: Pressure contours for flow around Stage 37 using mixing plane boundary conditions

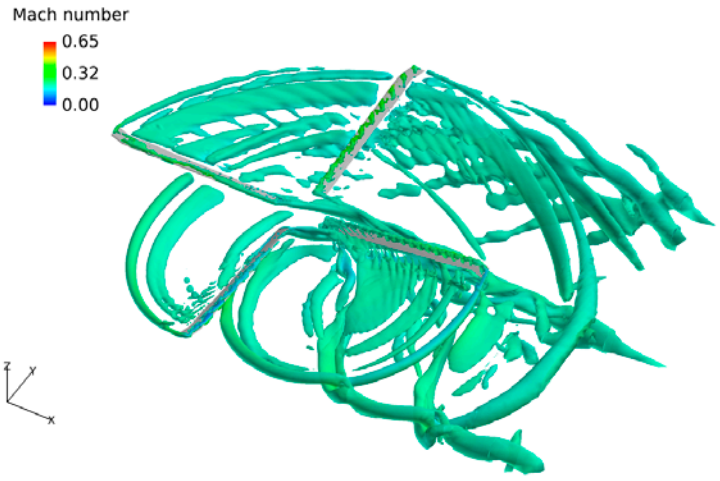

Fig. 3: Q-criteria of UH-60A rotor analysis

Publications

N/A

Usage of JSS

Computational Information

Process Parallelization Methods	MPI
Thread Parallelization Methods	N/A
Number of Processes	128 - 2048
Elapsed Time per Case	150 Hour(s)

Resources Used(JSS2)

Fraction of Usage in Total Resources[*1](%): 3.25

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage[*2](%)
SORA-MA	19,178,343.73	3.63
SORA-PP	71,061.28	0.56
SORA-LM	2,111.82	1.24
SORA-TPP	66.68	0.01

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage[*2](%)
/home	767.21	0.70
/data	93,530.98	1.81
/ltmp	4,045.09	0.34

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage[*2](%)
J-SPACE	6.16	0.20

[*1]: Fraction of Usage in Total Resources: Weighted average of three resource types (Computing, File System, and Archiver).

[*2]: Fraction of Usage：Percentage of usage relative to each resource used in one year.

- **Resources Used(JSS3)**

Fraction of Usage in Total Resources[*1](%): 0.32

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage[*2](%)
TOKI-SORA	449,385.19	0.10
TOKI-RURI	45,936.82	0.26
TOKI-TRURI	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage[*2](%)
/home	2,777.94	1.90
/data	41,948.05	0.70
/ssd	744.36	0.39

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage[*2](%)
J-SPACE	6.16	0.20

[*1]: Fraction of Usage in Total Resources: Weighted average of three resource types (Computing, File System, and Archiver).

[*2]: Fraction of Usage：Percentage of usage relative to each resource used in one year.